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<p>(51) International Patent Classification <sup>4</sup> : <b>B65D 41/20, 41/28, 39/04</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 90/06267</b> (43) International Publication Date: <b>14 June 1990 (14.06.90)</b></p>
<p>(21) International Application Number: <b>PCT/AU89/00513</b> (22) International Filing Date: <b>27 November 1989 (27.11.89)</b> (30) Priority data: <b>PJ 1678</b> <b>28 November 1988 (28.11.88) AU</b> (71) Applicant (for all designated States except US): <b>JOSEPH PARSONS NOMINEES PTY. LTD. [AU/AU]; 20 Moira Avenue, Ferntree Gully, VIC 3156 (AU).</b> (72) Inventors; and (75) Inventors/Applicants (for US only) : <b>PARSONS, Joseph, R., B. [GB/AU]; PARSONS, Joanna, Mary [GB/AU]; 29 Moira Avenue, Ferntree Gully, VIC 3156 (AU).</b> (74) Agent: <b>WATERMARK; 50 Queen Street, Melbourne, VIC 3000 (AU).</b></p>		<p>(81) Designated States: <b>AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.</b>  <b>Published</b> <i>With international search report.</i></p>
<p>(54) Title: <b>CAP</b></p> <div data-bbox="792 1144 1226 1732"></div> <p>(57) Abstract</p> <p>A cap (1) adapted for co-operation with a container (2) to provide a resealable enclosed space, said cap comprising an upper portion (3) including an elongate member (12) and a lower portion (4) having a barrier (5) or flap disposed on the lower portion to substantially prevent container contents contacting the elongate member when the cap is in a closed position, and to substantially reduce leakage of container contents when the cap is in an open or access position. An air space or cushion (6) may also be provided between the upper portion (3) and the barrier (5). A ring (8) may further be provided to seal between the upper and lower portions of the cap.</p>		

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CAPFIELD OF INVENTION

The present invention relates to an improvement, modification or advance over the invention disclosed in PCT Application No. PCT/AU88/00353 filed 9th September, 1988, entitled "CAP".

The present invention relates to a cap or closure member for a container and relates particularly but not exclusively to a cap or closure member capable of sealing the container in a substantially pressure tight manner to allow a predetermined reduced pressure to be applied to the cap and container combination to enable a fluid or fluidized sample to be drawn into the container by way of the reduced pressure. The present invention also relates to a cap or closure member which enables access to the fluid sample so collected without the necessity of removing the cap from the container. The present invention also relates to a cap or closure member which enables access to interior of the container by disassembling only a portion of the cap.

In particular, the present invention relates to such a cap having a membrane or barrier means which serves as a barrier and substantially reduces contamination and leakage of container contents when the cap is partially disassembled.

DEFINITION

Throughout this specification, the term "barrier" includes flap, valve, split or perforated membrane or buffer means which serves to reduce the passage of container contents or fluid therethrough.

PCT/AU88/00353 discloses a two part cap for a container, the cap enabling piercing access to the interior of the container for fluid sampling or evacuation thereof and non-piercing access by means of removing the top part of the cap structure to allow substantially unimpeded access to the interior of the container.

The top part of the cap comprises a substantially T-shaped portion, the bottom of which may come into contact with any fluid in the container when the cap is in a closed position.

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OBJECT(S) OF INVENTION

5 An object of the present invention is to alleviate some or all of the disadvantages of the prior art by providing a cap in which a barrier portion forms at least a partial barrier to leakage of container contents.

A further object of the present invention is to provide a cap in which an air cushion is formed in conjunction with the barrier means to further alleviate contamination and contents leakage.

10 DESCRIPTION OF INVENTION

The present invention may (in one preferred form) provide a cap adapted for co-operation with a container having an upper portion and a lower portion adapted to form a resealable enclosed space, said cap having barrier means disposed to reduce leakage of container contents.

15 The present invention may also provide a cap for attachment to a container, the cap forming a resealable enclosed space and having upper and lower portions, wherein, in a sealed position, an air cushion is provided adjacent the base of the lower portion, the cushion serving as a buffer to reduce contact of container contents with the upper portion.

25 The present invention also may (in another preferred form) provide a cap adapted for co-operation with a container to provide a resealable enclosed space capable of evacuation to a predetermined level of reduced pressure, said cap having two parts;

30 the first part comprising an upper portion including a pierceable cover portion having an integrally formed sealing member dependent therefrom; and

the second part comprising a lower portion including an access port for access to said enclosed space, the first and second parts being adapted to co-operate together to form a re-useable seal, the cap being adapted for piercing or non-piercing communication with said enclosed space; including

35 the improvement comprising :

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barrier means disposed on said second part and adapted to substantially reduce container contents leakage from said enclosed space or contamination of said first part by said contents.

5           The barrier means may be in the form of a split or perforated membrane, flap(s), buffer or valve like structure.

10           The present invention may also provide a cap adapted for co-operation with a container to provide a resealable enclosed space, said cap comprising an upper portion including an elongate member, and a lower portion having a barrier disposed on the lower portion to substantially prevent container contents contacting the elongate member when the cap is in a closed position.

15           The air cushion is defined in one form as bounded by the walls of the cap upper and lower portions and the barrier.

20           The present invention may further provide a cap for co-operation with a container, comprising an upper portion and a lower portion, the upper portion being detachable from the lower portion and allowing access to the interior of the container in such a detached position, wherein

25           a seal member or ring is provided on the upper portion which engages a corresponding recess on the lower portion, the seal and recess forming a reuseable seal between the upper and lower portions.

30           Throughout this specification, the term "tube" or "container" is to be construed in a broad sense. A most preferred and specific application of the present invention relates to test tubes, laboratory analyser containers, jars or specimen containers, although not exclusively so.

35           The cap of the present invention may be made of one or more suitable materials of any type. Preferably, the cap material allows the cap to provide the function of being sealable and adapted to be pierceable. The material may also be elastically deformable. The material may be silicon rubber, soft rubber, neoprene, other suitable pierceable material(s), or a combination thereof.

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Preferred embodiments of the present invention will now be described with reference to the accompanying drawings, wherein :

Figure 1 shows a first embodiment of the present invention;

Figure 2 shows a second embodiment of the present invention; and

Figures 3A and 3B show alternative views of the underneath of the upper portion of the cap.

Figures 4A and 4B show alternative arrangements of the lower and upper portions of the cap, respectively.

It is to be noted that throughout the Figures, means or features of the same or similar type are indicated by the same reference numeral. Also, the gaps shown between upper and lower portions of the cap are only for the purpose of illustration of the components outline.

Figures 1, 2, 4A and 4B show a cap 1 having an upper portion 3 and a lower portion 4. The cap 1 is shown attached or held in place in relation to a tube or container 2 by means of a recess or rim 13 in the case of Figure 2 or bulges 20 of Figure 4A provided in the lower portion 4 of the cap which co-operates with the top of the tube 2. Lip 14 provides a seal about the tube 2 in addition to the inner surface 15 of recess 13.

The cap may alternatively have the lower portion 4 formed as an "all in" push type wherein a shoulder 16 is only provided to prevent the cap from being immersed too far into the tube 2.

The lower portion 4 generally provides an access to tube interior or contents via access 11. The access 11 may be of any suitable size within the limits of the container's size and its designated application. The upper portion 3 of the cap 1 is generally T-shaped, wherein the elongate member 12 fits into or co-operates with the access in a substantially sealing manner. The upper portion 3 is provided with a ring or seal 8 around the elongate member which mates with a corresponding depression in the lower portion 4 to provide additional sealing to the cap in its

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closed position. Furthermore, the ring substantially prevents the upper and lower portions from separating without operator intervention.

5       The access 11 of the lower portion may be of any suitable size as noted above and may be almost as large as the tube opening into which the lower portion 4 fits. This allows for easy access to the tube contents by a probe of a laboratory analyser if the lower portion is fitted to a suitable analyser sample cup.

10       A recess 7 can be provided in the upper portion to facilitate piercing access to the interior of the tube and its contents generally through the elongate member 12. The recess 7 may be quite large in relation to the upper portion, thereby leaving only a narrow wall to be pierced during piercing access to the sealed container.

15       The lower portion 4 is provided with a barrier means or flaps 5 which form a barrier or buffer between the interior of the tube or its contents and the upper portion 3 and/or the outside world. In the case where a tube and cap combination has the upper portion 3 removed, the access position, and the tube is, for example, accidentally knocked over, the barrier 5 is designed to substantially prevent the tube contents from escaping. The barrier need not be continuous, it may be perforated, slotted or have a small hole therein as shown in Figure 3A to allow passage of a non-piercing probe into the tube, and thereafter when the probe is withdrawn, substantially forming a leak resistant barrier again. This alleviates contamination. Also an air space or cushion 6 is also provided between the barrier 5 and the upper portion 3 when the cap is in a closed or fitted position. With the upper portion in a fitted or closed position, the air space 6 provides a cushion of air which substantially prevents the barrier 5 from opening and releasing tube contents if the tube is knocked over and thereby contaminating the upper portion 3. Also, in an open position (without the upper portion 3 in place), barrier 5 also reduces the amount of tube contents released if the tube is knocked over. In fact, barrier 5 also aids in

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laboratory analysis by reducing specimen evaporation while the specimen is awaiting testing. This evaporation is a major source of diagnostic error. The barrier is formed so as to allow an analyser probe or pipette or needle to pass therethrough so that a sample can be obtained from the tube contents. Upon retraction of the probe or pipette, the barrier resiliently moves back in place to again substantially prevent leakage of tube contents. The barrier may additionally act to wipe the probe, pipette or needle as it is withdrawn from the container, which will further reduce contamination. Figure 3A shows a preferred barrier 5 having a quadrant shape, however, it is understood that many other shapes are equally useful.

As shown in Figures 2, 3A and 3B, feet 9 may be provided on the bottom of upper portion 3. The feet 9 may assist in holding the flaps in a closed position. The air cushion 6 may be formed between the feet 9. Furthermore, as shown in Figures 2, 3A and 3B, between each foot, a pocket of air 6 is held. In this way, the provision of feet provides a number of smaller air cushions 6 to assist barrier 5 retaining the container contents.

As shown in Figure 3A, feet 9 may be oriented to sit over the joins or edges of flaps 5. However, the feet may be offset from the slots 10 which define parts of the barrier 5 and still provides an effective support to the barrier, the air cushion(s) then also helping to prevent the barrier from opening when the cap is in a closed position, in order to assist in the operation of the barrier.

There may be provided any number of barrier parts and they may also be arranged in a layered fashion to further accentuate the effect of the present invention.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A cap adapted for co-operation with a container having an upper portion and a lower portion adapted to form a resealable enclosed space, said cap including barrier means disposed on the lower portion to substantially reduce leakage of container contents.
2. A cap as claimed in Claim 1, wherein the barrier means is formed integrally with said lower portion.
3. A cap as claimed in Claim 1 or 2, wherein the barrier means is slotted to form flaps.
4. A cap adapted for co-operation with a container to provide a resealable enclosed space, said cap comprising an upper portion including an elongate member, and a lower portion having a barrier disposed on the lower portion to substantially prevent container contents contacting the elongate member when the cap is in a closed position.
5. A cap as claimed in any one of Claims 1 to 4, wherein an air cushion is provided between the lower portion and the barrier.
6. A cap as claimed in any one of Claims 1 to 5, further comprising feet disposed on the upper portion.
7. A cap as claimed in Claim 6, wherein in a sealed position, said feet serve to abut the barrier.
8. A cap for co-operation with a container, comprising an upper portion and a lower portion, the upper portion being detachable from the lower portion and allowing access to the interior of the container in such a detached position, wherein

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a seal member or ring is provided on the upper portion which engages a corresponding recess on the lower portion, the seal and recess forming a reuseable seal between the upper and lower portions.

9. A container in combination with the cap as claimed in any one of Claims 1 to 8.

10. In a cap adapted for co-operation with a container to provide a resealable enclosed space capable of evacuation to a predetermined level of reduced pressure, said cap having two parts;

the first part comprising an upper portion including a pierceable cover portion having an integrally formed sealing member dependent therefrom; and

the second part comprising a lower portion including an access port for access to said enclosed space, the first and second parts being adapted to co-operate together to form a reuseable seal, the cap being adapted for piercing or non-piercing communication with said enclosed space;

the improvement comprising :

barrier means disposed on said second part and adapted to substantially reduce container contents leakage from said enclosed space or contamination of said first part by said contents.

11. An improvement as claimed in Claim 10, further comprising an air cushion between said barrier means and said first part when the cap is in a sealed position.

12. A cap as claimed in any one of Claims 1 to 9, substantially as herein described with reference to the accompanying drawings.

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Fig. 1.

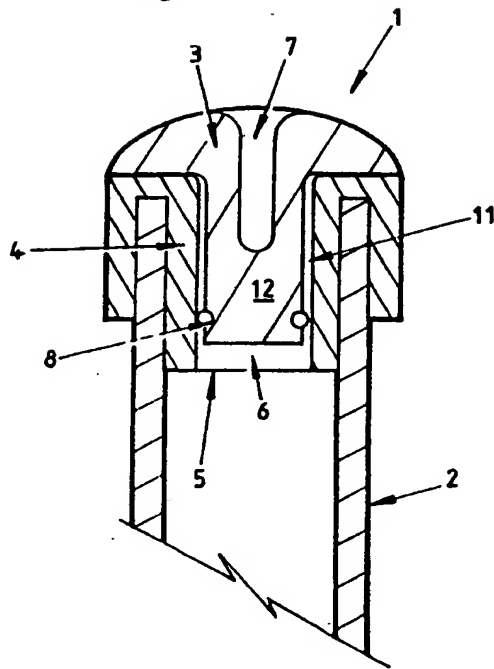


Fig. 2.

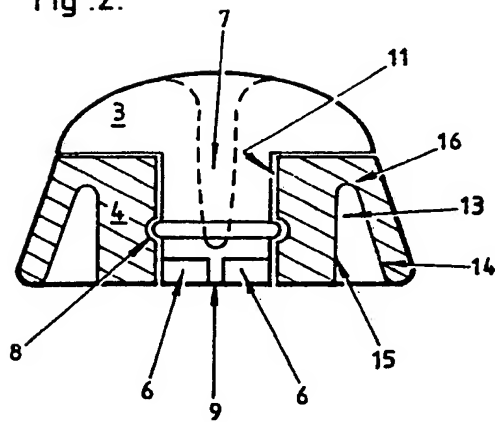
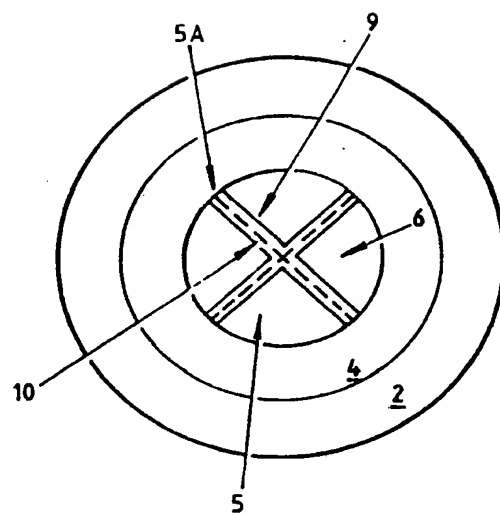
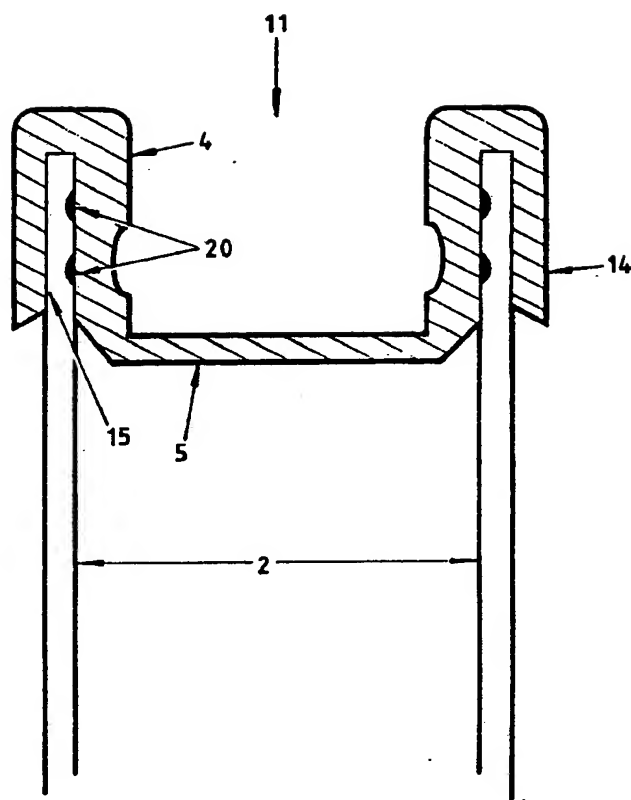


Fig. 3.



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Fig 4 A.



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Fig 4B

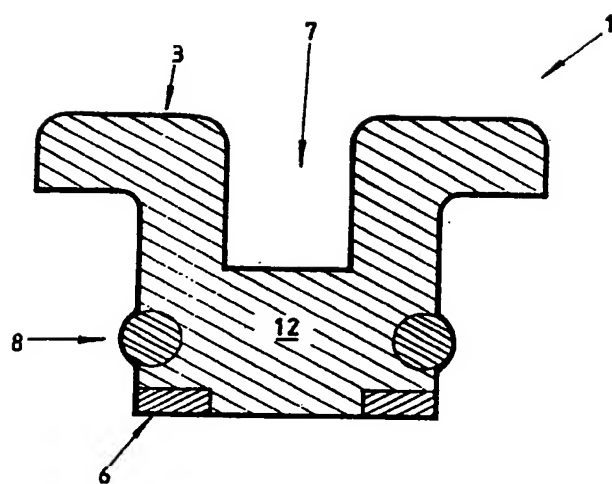
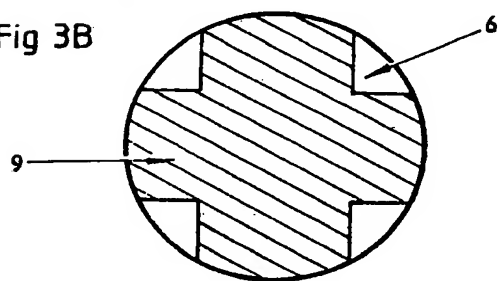



Fig 3B



# INTERNATIONAL SEARCH REPORT

International Application No. **PCT/AU 89/00513**

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) 6		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int. Cl. <sup>4</sup> B65D 41/20, 41/28, 39/04		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched 7		
Classification System	Classification Symbols	
IPC	B65D 39/04, 41/20, 41/28	
Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in the Fields Searched 8		
AU: IPC as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> 9		
Category*	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages 12	Relevant to Claim No 13
P,X	AU,A, 24221/88 (JOSEPH PARSONS NOMINEES PTY LTD) 23 March 1989 (23.03.89)	(1-3, 10)
X	AU,B, 58210/80 (547866) (YOSHINO KOGYOSHO CO, LTD) 20 November 1980 (20.11.80)	(8)
X	AU,B, 36932/78 (517738) (BECTON, DICKINSON AND COMPANY) 13 December 1979 (13.12.79)	(1-3, 10, 11)
X	AU,A, 24776/77 (BECTON, DICKINSON AND COMPANY) 9 November 1978 (09.11.78)	(1, 2, 4)
X	AU,B, 22251/77 (506028) (BECTON, DICKINSON AND COMPANY) 24 August 1978 (24.08.78)	(1, 2, 4, 5)
X	AU,B, 16527/47 (138155) (FREEMAN) 18 December 1947 (18.12.47)	(1-6, 8-11)
X	AU,B, 415/38 (104862) (FREEMAN) 1 September 1938 (01.9.38)	(1-5, 9-11)
A	US,A, 4545497 (MARTHA) 8 October 1985 (08.10.85)	(3)
<p>* Special categories of cited documents: 10    "T"    later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance    "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"E" earlier document but published on or after the international filing date    "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means    "&amp;" document member of the same patent family</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search 5 February 1990 (05.02.90)		Date of Mailing of this International Search Report ( ) <b>28 February 1990</b>
International Searching Authority <b>Australian Patent Office</b>		Signature of Authorized Officer <b>G M COX</b> 

## FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE 1

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim numbers ..., because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claim numbers ..., because they relate to parts of the international application that do comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3. ☐ Claim numbers ..., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4 (a):

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING 2

This International Searching Authority found multiple inventions in this international application as follows:

The only features common to all of claims 1, 4, 8 and 10 are an upper portion and a lower portion. These features are to be found in many caps and consequently claims 1, 4, 8 and 10 lack a single general inventive concept.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
  
3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
  
4. ☒ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

## Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.  
☐ No protest accompanied the payment of additional search fees.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON  
INTERNATIONAL APPLICATION NO. PCT/AU 89/00513

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Members			
AU 24221/88	WO 8902399				
AU 58210/80	CA 1145301 FR 2460850 JP 55155605 US 4291818	CH 652681 GB 2053164 JP 62000683 US 4343397	DE 3018908 IT 1141341 NL 8002751 JP 55163158		
AU 36932/78	CA 1113817 GB 1583619 SE 426648	DE 2824588 JP 54004191 US 4134512	FR 2393583 JP 60049248		
AU 24776/77	BE 858744 FR 2365493 ZA 7702491	BR 7703243 JP 53059585	DE 2717903 SE 7705768		
AU 22251/77	BE 852053 FR 2342907 NZ 183263 US 4136794 US 4226333 US 4301936	BR 7701303 GB 1533216 SE 425591 US 4186840 US 4290534 US 4338764	DE 2706337 JP 52108286 US 4111326 US 4187952 US 4295572		
US 4545497					

END OF ANNEX